S S R L

Stanford Synchrotron Radiation Laboratory (SSRL) provides synchrotron radiation and ancillary equipment. The facility, which comprises 25 experimental stations, is used each year by nearly 900 researchers from industry, government laboratories, and universities – including astronomers, biologists, chemical engineers, chemists, electrical engineers, environmental scientists, geologists, materials scientists, and physicists.

Biological sciences, environmental sciences, and studies of materials are major areas of research. Detailed studies of biological structures by corporate and academic scientists are being used to understand disease processes and to develop better drugs for intervention. Recent studies include work on AIDS, diabetes, multiple sclerosis, myasthenia gravis, rheumatoid arthritis, and the flu virus. Other SSRL research has shown how muscles contract and how various genetic defects lead to cancer and Lou Gehrig's disease. Using imaging techniques possible only with synchrotron radiation, the progression of osteoporosis and the effects of various treatments are being studied.

Movement of electrons within superconducting materials is key to their properties. Studies at SSRL have revealed unusual behavior which does not conform to the accepted theories. This work is leading to a more general theoretical understanding of electron movement which will further the development of practical applications.

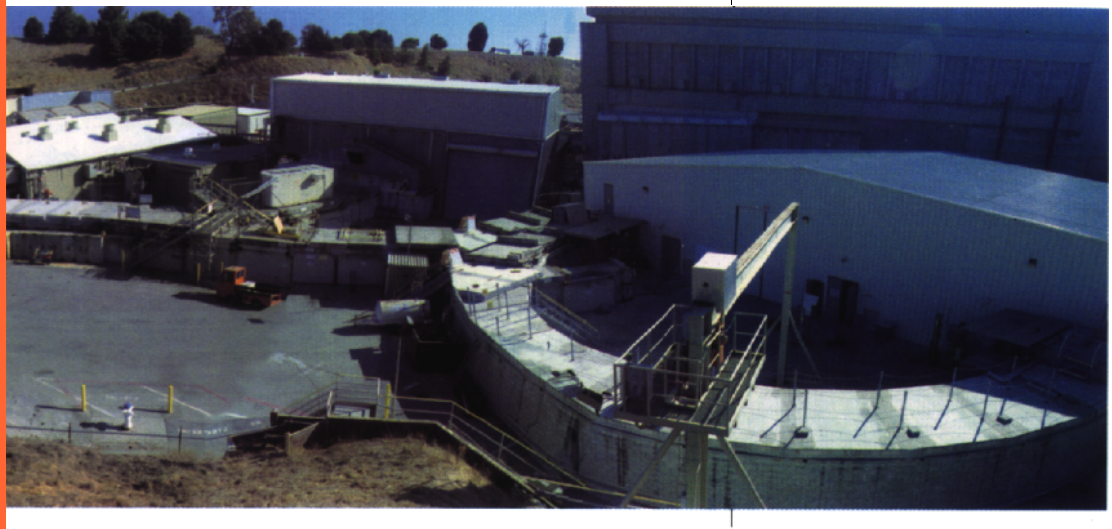
Remediation of toxic environmental sites is limited by insufficient knowledge of how the relevant toxic materials are chemically bound in waste storage or contaminated soils or waters. In a program involving close cooperation of SSRL and four other national laboratories, the intense X-rays at SSRL are being used to study these interactions. Engineers will use these results to more effectively guide strategies for cleanup and long-term waste management. In other environmental studies, DOE and academic scientists are characterizing the nature of selenium contamination in agricultural regions. Studies are being done to develop remediation techniques for lead contamination, and to identify the presence of arsenic in contaminated soils.

Prompted by the semiconductor industry, research is focusing on ways to reduce the metal contamination on silicon wafer surfaces, which can destroy their performance. Synchrotron radiation is being developed as an analytical tool which will allow industry to improve their manufacturing processes for next-generation integrated circuits.

SSRL is currently used by 155 institutions in 35 states and 15 foreign nations. These include 59 universities, 37 private corporations, 18 governmental laboratories, and 41 foreign institutions.

ACCOMPLISHMENTS

Developed the first wiggler and undulator insertion device magnets as sources of enhanced synchrotron radiation; continued with subsequent



The Stanford Synchrotron Radiation Laboratory is built around the storage ring SPEAR. The small ring at right is the booster synchrotron and injector. The laboratory's experimental stations are housed in the buildings on the left and rear.

STANFORD SYNCHROTRON RADIATION LABORATORY

insertion devices with increased capability including polarization control.

Developed an experimental station with an advanced detector for protein crystallography experiments that is now providing access for hundreds of academic and industrial scientists studying structure of biological materials.

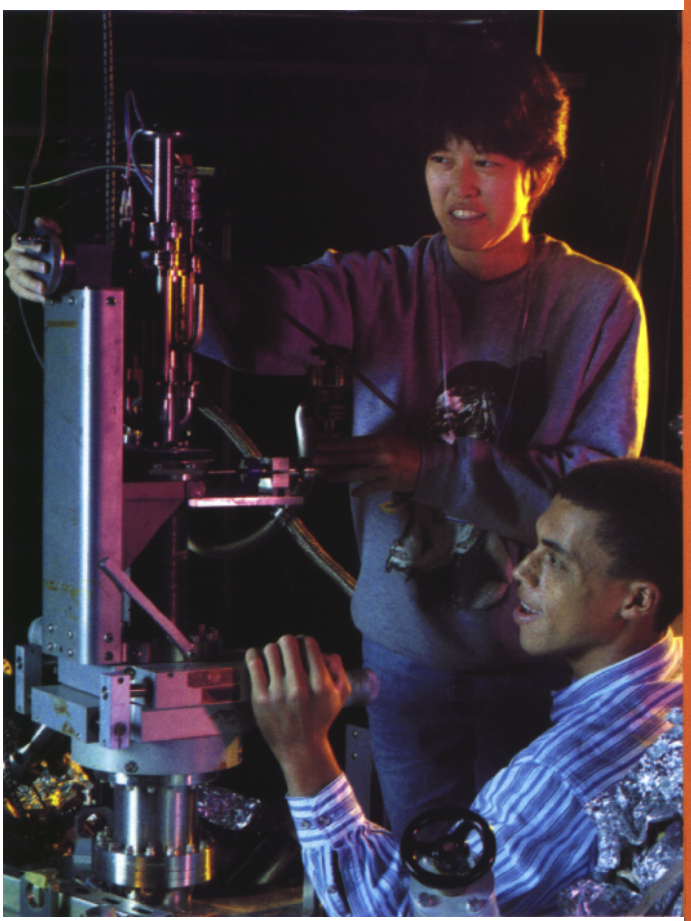
Discovered key properties about the high-temperature superconductors which led to a novel mechanism completely different from conventional superconductors and will further the development of practical applications.

Performed the first dynamic, real-time X-ray study of how semiconductors grow in the commercially important organic-metallic vapor phase epitaxy process.

INDUSTRIAL USERS

- Adelphi Technology
- Advanced Micro Devices
- Affymax Research Institute
- Alchemist Technologies
- ARACOR
- Bristol-Myers
- Chevron Research & Technical Company
- Conductus, Inc.
- Digital Semiconductor
- Dow Chemical Company
- DuPont-Merck Pharmaceuticals
- Eastman Kodak Company
- E.I. duPont de Nemours and Co., Inc.
- Edge Analytical Inc.
- ESRS Corporation
- Exxon Research & Engineering
- Genentech, Inc.
- General Electric Co.
- Hewlett Packard
- Hirsch Scientific
- IBM Research Laboratory
- Industrial Automation
- Intel Corporation
- Interphases Research
- IBM Technologies
- Lucent Technologies
- Monsanto Company
- Morris Research, Inc.
- Motorola
- Orthologics
- Ovonic Synthetic Materials Co.

Anne Matsuura and Paul White, Stanford University graduate students, prepare a vacuum chamber which will be placed on the end of an SSRL soft X-ray experimental station. Samples for research on high temperature superconductors will be placed in the chamber for exposure to the synchrotron radiation beam.



- Siemens
- Squibb Research Institute
- Surface Interface
- Syntex Research
- Texas Instruments, Inc.
- The Dow Chemical Company
- The EXAFS Company
- Wacker-Chemitronic
- X-ray Instrumentation Associates
- Xerox
- Xsirius, Inc.